THE JOURNAL OF GEOGRAPHY

VOLUME X OCTOBER, 1911 NUMBER 2

THE RAILROADS, INDUSTRIES AND DISTRIBUTION OF POPULATION IN MICHIGAN

By A. E. PARKINS,
Michigan State Normal College, Ypsilanti

ABOUT the year 1600 Francis Bacon made a statement axiomatic for all times when he said, "There are three things which make a nation great and prosperous—a fertile soil, busy workshops, and easy transportation." Michigan has these to such a degree as to compare favorably with any other of our states, when we consider her position and the time since men have come to her to make permanent homes. With 1620 miles of shore line, 70,000 miles of public roads, almost a thousand miles of electric lines and 8700 miles of railroads, she has transportation facilities, natural and developed, sufficient to place her in the first rank.

The purpose of this little study is to show that her railroads are distributed where they are needed, many miles of railroads where the density of population is greatest, and where other items that accompany great density are greatest; fewer miles of railroads where we have less of these. In the well settled portions of the state, about 92 per cent of the area is within five miles of a railroad station. In the less densely settled areas where the need is less we have areas much farther from a shipping point. Yet, so evenly are the railroads distributed, that only 20.8 per cent of the total area of the state is more than five miles from a shipping point and only 3.8 per cent of the state is more than 10 miles.

The distribution of the railroads of the state is brought out very effectively by Fig. 1 which might properly be called a "Distance from Station Map." It shows the distribution of railroads by antithesis, i. e., it shows where they are by pointing out where they are not. Some parts of the map are blank, some dotted, some lined, and some black. The legend explains the scheme of shading.

The part of the map that has the least shading represents that part of the state that has the greatest mileage of railroads. The deeper the shade the less the mileage. Thought of in terms of the shading of this map, railroads bring enlightenment and development.

The most conspicuous spots are the areas shaded black, places more than 25 miles from a station. There are four of these, Isle Royal in Lake

Superior, Beaver Island in Lower Michigan, Point Detour and islands near, and Whitefish Point. The transportation facilities of these places are not as inadequate as this map shows for they have steamboat connections in the summer time, but for three to five months during the year they are as isolated as the map designates. The islands often have no communication whatever with the mainland for two to four months. Other areas of deep shades are found east of the base of Keweenaw Peninsula and northwest of Saginaw Bay. Particularly striking is the Thumb with areas in the central part and along the shore. Shore settlements have

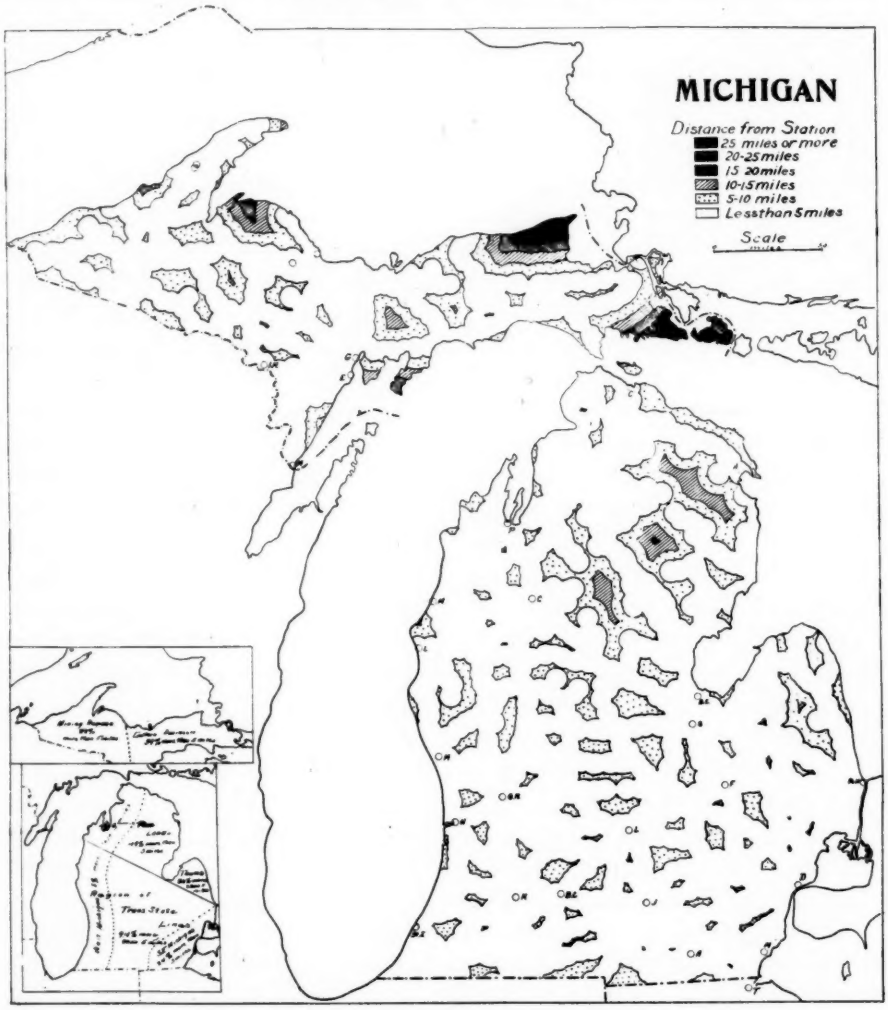

Fig. 1. Railway Distance Map of Michigan. This map shows the distribution of railroads by antithesis, i. e., it shows where they are by showing where they are not. It also gives a good idea of the length of farm haul in the various parts of the state.

steamboat connections during short seasons. The Southern Peninsula is much better supplied with railroads than the northern. Large blank areas are found in many places, as about Port Huron, Saginaw, Kalamazoo, Traverse City, and Detroit.

The distances represented on the map are air line distances. The real transportation distance for the commerce of the farm is too complicated a question to be determined by an off-hand method. It is a question of the best road, best market, largest trade centers, and many others. The map serves to give a good idea of the railroad distribution except where two or more lines closely parallel each other and it gives one a good idea of the length of the "farm haul" in all parts of the state.

A consideration of the "farm haul" in the commerce of the farm is one that rarely enters into our discussion of trade manipulation. The cost of getting articles to and from farms rarely receives much serious consideration even from the farmer himself, although it affects his own personal comfort, the acreage value of his land and the net income of his farm. The cost of haulage on dirt roads is placed by one authority at from twenty to twenty-five cents per ton mile. At this rate if we consider the average length of haul of Michigan products of the farm to be five miles, the cost of marketing the wheat crop of Michigan in 1904 would be over $500,000; and to market the entire yield of grain the cost would be $3,300,000. On account of the impassibility of many roads at certain seasons, the task of marketing the products of the farm is a great burden upon the American commercial world. Railroads are obliged to keep on hand many cars that must remain idle a greater part of the year, in order to be able to handle the immense freight traffic of a short season. With better roads and shorter hauls this great burden might be in part obviated. The farmers of Michigan in that part of the state in which there is the most farming are extremely fortunate in having such a net work of railroads that the haul rarely exceeds five to seven miles, as is shown by our map and the following figures derived from the map.

By means of planimetric measurements the figures in table 1 were determined.

TABLE 1. SQUARE MILES OF LAND DISTANT FROM RAILROAD STATION MORE THAN

	5 miles	10 miles	15 miles	20 miles	25 miles
S. Peninsula	6800	540	44		
N. Peninsula	5050	1630	1166	690	410
Total	11850	2170	1170	690	410

"Table 1"

The percentages of land at distances indicated, in the natural and arbitrarily selected portions of the state, are indicated on the small insert map in Fig. 1 and also by the following table: (Table 2).

TABLE 2. PERCENTAGES OF AREAS MORE THAN

	5 miles	10 miles	15 miles	20 miles	25 miles
S. Peninsula	17.	1.3	.01		
N. Peninsula	30.	10.	7.	4.	2.6
Total	20.8	3.8	2.	1.2	.7

"Table 2"

The reason for such a distribution of railroads is due to a multitude of causes. Topography seems to have had little effect in the distribution, the land everywhere being of slight relief. In some places, however, railroads have found it to their advantage to follow river valleys in making their way through regions somewhat hilly. This is especially true in that portion known as the Interlobate Moraine region stretching from Lapeer southwestward to the Ohio and Indiana boundary line.

Plains and drainage channels likewise furnish level stretches or easy grades. Drainage channels seem to have offered great inducements to railroad builders. Numerous instances may be cited of railroads following these old glacial water channels. The Michigan Central from a few miles west of Jackson, follows a drainage channel to Kalamazoo and beyond, in all a distance of over fifty continuous miles. The Grand Trunk from Charlotte to Battle Creek is in one nearly all the way. The Grand Trunk from east of Ionia follows the glacial outlet of Lakes Maumee and Whittlesey almost to Grand Rapids, leaving the valley only because of the great detour it makes to the north. The Michigan Central for over one-third of the way from Bay City to Cheboygan is in such channels.

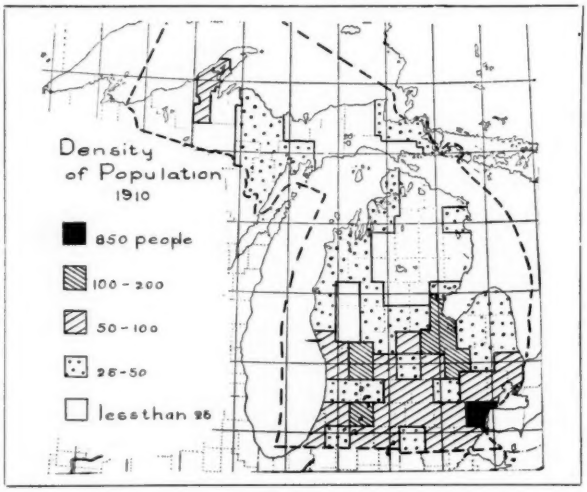

Fig. 2

While relief seems to have had little effect in determining the distribution of railroads, there is great similarity in the distribution of people and railroad mileage as is brought out in comparison of Figs. 1 and 2.

This could not be otherwise, for railroads depend upon people for their support, and people depend upon railroads to supply their needs. The greater the density of population the more need is there for railroads. In a thickly settled section, as a city, man depends upon others to supply all his needs and in the supplying of most of these the railroad is an absolute necessity. It is precisely in the southern, older, and more densely settled part that we have the greatest railroad mileage as shown by the large areas of blank spaces on our Railroad Distance Map. It is in the areas where the density is below twenty-five per square mile, and even below ten per square mile, that we have the largest pieces of land that are distant more than five, ten, and even fifteen miles from a station. In the Northern Peninsula there is likewise a relation between density of population and railroad mileage, although not clearly shown by this map and not so close as in the Southern Peninsula, for people here live mostly in groups. In

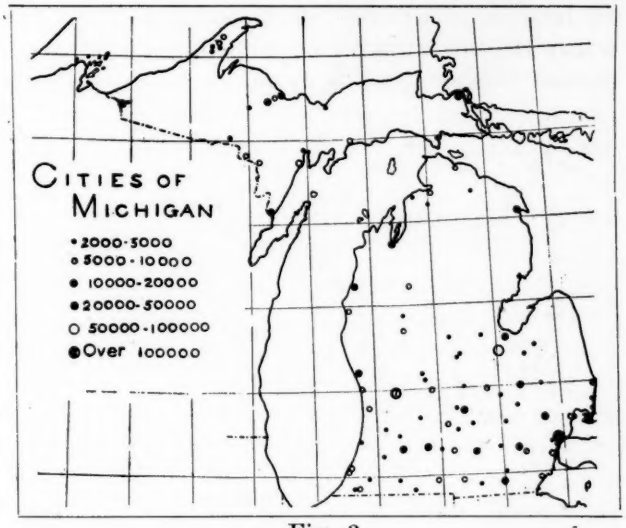

Fig. 3

the western part we have a net-work of railroads to carry the products of the mines to ports on the lakes. In the Eastern Peninsula we have no mines and fewer people. But all of the mileage in the Northern Peninsula is not due solely to the mines. Some of it is due to the trans-state lines. The railroads are there because that land offers the shortest route between the east and west. The Southern Peninsula also owes much of its mileage to trans-state lines. There are few intra-state lines and few lines running north and south. Most east and west lines are trans-state. All of the trans-state lines in the southern peninsula lie south of a line from Port Huron to Frankfort, and in this region we see from Fig. 1 that but 9.4 per cent of the land is more than five miles from a station. From Grand Rapids southward the roads secure the western traffic by passing

around the south end of the lake, but north of Grand Rapids it is cheaper and saves time to make use of the car ferry. The Thumb and the northern part of the Southern Peninsula are the only parts of the state not crossed by trans-state lines.

In laying out any railroad, cities and towns have a strong influence in determining the direction the lines will take, for they are the source and destination of most of the freight. In Fig. 3 are shown the cities of Michigan having a population of two thousand or over. The size of the city may be determined by the symbol used to show the location as indicated in the legend. A study of this map shows that there is a striking relation between the distribution of railroads and the cities. All the large cities are in the southern half where we have the blank spaces on the map shown in Fig. 1. In this map we see many more cities in the mining region of the Northern Peninsula than in the eastern part.

Since our large manufacturing establishments are located in the cities and towns a map showing distribution of industries, and thus one of the sources of railroad traffic, would be similar to the map of cities. Fig. 4

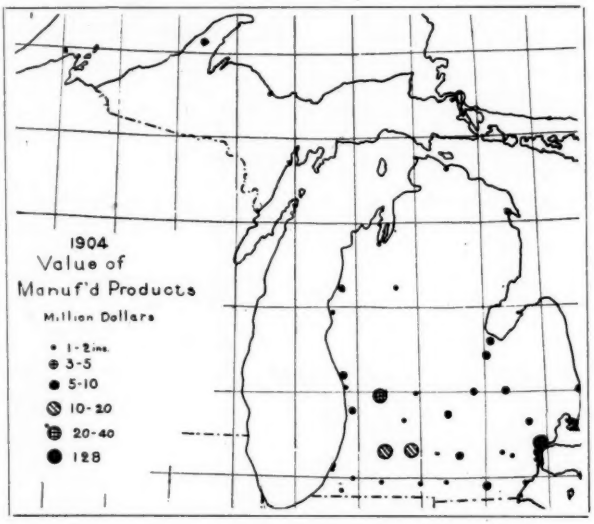

Fig. 4

gives cities that produce manufactured products of over one million dollars and the amount produced at each. All of the largest manufacturing establishments are in the southern part, south of Bay City and Muskegon. West Michigan again shows up well. The Northern Peninsula has scarcely reached the manufacturing stage. Only at one place is the value three million dollars.

Another source of the freight of railroads is the products of the farms. Fig. 5 shows that there is a similarity in the distribution of farm products

and railroads. The power of a farming community to produce wealth is closely linked with the transportation facilities offered by its rivers, lakes, roads, and railroads. The value of farm products lies not alone in the

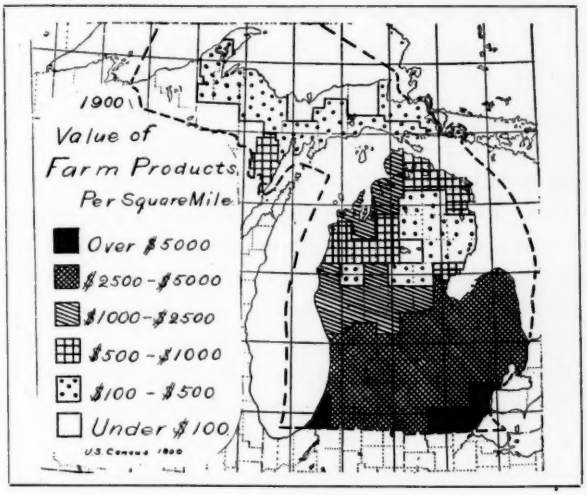

Fig. 5

quantity produced but in the kind. If transportation facilities are so poor that the marketing of the products is next to impossible a great variety of paying farm products, as fruits and garden truck, which demand quick transportation, will of necessity give way to the bulkier but less valuable products. The farming region of Michigan is plainly south of a line from Saginaw Bay to Muskegon. The poor showing of the Pine Lands is brought out again in this map. The Thumb compares favorably with the region to the south. We can plainly see that the Upper Peninsula furnishes but little freight from the farm.

The Thumb, although lacking in most of the inducements for railroads, has a small mileage because of its isolation. It is a peninsula. The very deep shading at Detour and Whitefish Point is partially due to the same cause. Any railroad traversing such peninsulas must have as one terminus a small population center.

Northeastern Michigan shows lack of development in every item shown on the series of maps. There are few people and consequently a lack of everything that accompanies man. Everything is undeveloped. This state of affairs must, no doubt, be laid to the unfavorableness of the land. It is not adapted to the same methods of agriculture that other portions of the state are, and hence man has settled in other nearby regions. With the correct method of tillage this land may be made to grow paying crops. Some of it is now being reforested by both private parties and the state. The State Forestry Nursery is located in this region. Most of the region in Northeastern Michigan has few people and the mileage is as great as

it is because of the large number of logging roads. This is particularly true in that portion covered by hemlock and hardwood forests. The two large areas shown on the map of Railroad Distances are in the region drained by the AuSable, Rifle and Thunder Bay Rivers, streams that played an important rôle in the lumbering industry twenty or thirty years ago, before the days of logging by railroads.

Western Michigan shows a remarkable railroad development, [See small insert map in Fig. 1] only eight per cent of the area is more than five miles from a railroad station. It excells eastern Michigan, if we except Detroit, in every item that seems to indicate development. Its transportation facilities are even greater than are indicated by our railroad map, for besides the six trunk line railroads, every part on the western shore has steamboat connections with Milwaukee and Chicago during a long season of navigation. This makes it a part of the sustenance space for these cities.

Southeastern Michigan, leading in density of population, cities, manufactures, and agricultural products shows the best development in railroads—about ninety-eight per cent of the area is within five miles of a station, and the transportation advantages are not at all adequately shown by the map, for along the lacustrine plain from Detroit to Toledo extend four parallel lines of steam roads; and one and for a portion of the way two electric lines, not to mention the excellent service furnished by two or more steamboat companies. These two cities are the New York and Philadelphia of the plain that lies between the highland to the west and the waters to the east.

An examination into the growth of railroad mileage in Michigan shows that it has been gradual. Railroads were built as needed and therefore there should be that relation of railroad mileage to density of population, size and number of cities, value of manufactured products, and value of the products of the farm that we have tried to show. The increase in mileage at the present time is due to roads built in the mining and forested regions. In these regions many will be abandoned. Such roads are constantly being adjusted to meet the changing conditions and we may expect great increases in the future as farming replaces the present temporary occupations and the people settle into permanent homes. In the southern part of the state the railroads are adjusted to the requirements of transportation, and we can expect no decrease and only a gradual increase of mileage from time to time as cities and industries grow and new demands are made.

A NEW ZEALAND EXAMINATION IN PHYSIOGRAPHY

(Civil service senior. Eight questions to be answered.)

1. Distinguish between sidereal time, apparent solar time, and mean solar time. How could you obtain by a simple graphic method the correc-

tion to be applied to the time of a sun-dial in order to obtain the mean time?

If the sun rises at 6h, 54m. and sets at 4h. 33m., find the equation of time.

2. What do you understand by the term "centrifugal force?" Illustrate your answer by reference to experiments and to the motion of the earth. How can it be shown that the weight of a body varies according to latitude? Explain as fully as you can the reasons for this variation.

3. Write a short description and explanation of the solar spectrum, with special reference to its heating and chemical effects. How do you account for the occurrence of dark lines and bands across the spectrum? How is it that some of these are variable?

4. On the North Canterbury coast a warm, still morning in winter is generally followed by a cold, damp, easterly wind in the afternoon. At times, even in winter, a dry and warm wind blows over the Canterbury Plains from the snow-clad mountains of the north-west. Explain as fully as you can the causes of these winds, with especial reference to their temperature and humidity.

5. Write an account of the composition and mode of formation of the following: (*a*) Sandstone; (*b*) clay; (*c*) calcite; (*d*) conglomerate; (*e*) pumice; (*f*) obsidian.

6. Describe two laboratory experiments by which the rotation of the earth may be demonstrated. How do we know that the inclination of the axis of the earth is not constant? Can you account generally for the movements of the axis?

7. What is meant by the "latitude" and "longitude" of a place? Describe fully how they are determined at sea. How could the use of a chronometer be dispensed with?

8. "The *crescent* moon was *rising* o'er the hill."
Comment briefly on the above.

How do you account for the fact that the moon presents the same face to the earth, and how is it that we are nevertheless able to see about 59 per cent. of the moon's surface?

9. Explain the causes of ocean tides and of the differences between spring and neap tides.

10. Explain the formation of glaciers, and their mode of movement, and state how their velocities may be determined. Describe and account for the following: (*a*) Glacier mills; (*b*) potholes; (*c*) crevasses, (*d*) moraines.

11. On any ordinary map it would seem that the Panama Canal would open up a very such shorter route from New Zealand to England than the one by way of Cape Horn, whereas in reality the difference is not very considerable. How do you account for this? Which map would show the greater difference—a map on Mercator's projection, or one on the equidistant projection? Give reasons for your answer.

MAN AND HIS ENVIRONMENT IN NORWAY

By BERTHA HENDERSON,
Whitewater, Wis.

IN this short article I shall not attempt to explain from a geographical standpoint the intricacies of Norwegian history, literature, and character. It is my aim only to show in a broad general way the conditions that surround the people and how the people have either adapted themselves to environment or made use of their surroundings to promote their general welfare.

The southern tip of Norway lies about five miles south of the 58th parallel, or in the same latitude with Sitka. From this point the land stretches northeast 1100 miles until the last of it lies almost on the top of the world, within less than 1200 miles of the North Pole, while one-third of the country is on the cool side of the Arctic Circle. Its greatest width, which is in the southern part, is about 310 miles. The width lessens toward the north until in Nordland it is less than six miles. On the east lies Sweden and to the west are the Atlantic Ocean and the drift of the Gulf Stream. The British Isles are only about 500 miles across the North Sea, and Denmark is just over the Skager-Rak; within easy steaming distance to the south, are Belgium and the Netherlands with their dense populations.

The surface of Norway is a huge block of primary rock made up almost entirely of crystalline formations, granite, schist, gneiss, etc. In a few places sedimentary rocks have been discovered recently. The most notable of these are, first, an area to the north and east of Christiania, along the Bergen Railway where outcrops of alternating bands of black and white limestone of the Silurian formation occur and, second, on the banks of Lake Mjosen and near Trondhjem Stift. None of these overlying formations are of large area, and if at early geological times they covered the country all traces of them have been effectually scoured away. There are no distinct mountain ranges but in places, notably in the Romsdal, the gneiss, the oldest of the formations, towers in sheer bare pinnacles 5000 to 6000 feet in elevation. The backbone or crest of the plateau follows closely the line between Norway and Sweden until opposite Trondhjem. There it swings off to the southwest in the direction of Stavanger. The eastern side slopes gently into the lowlands of Sweden, but the western side descends abruptly into the Atlantic Ocean. The entire mass of twisted, contorted rocks has been faulted, jointed, and overthrust from the forces within the earth, and scoured and worn on the surface by the agents of erosion. On the southeast long, sloping, wide valleys and tame, rounded hills lead off toward the lowland, but on the west the massive block of rock has been gashed by deep trenches thousands of feet below

sea level and extending back into the mainland for scores of miles. These fiords are separated by flat-topped plateaus. Along the Sogne Fiord and its branches the Aurlands and Nearo, the Bejteln headland, and the pointed Gjeitegg rise sheer from sea level more than 3000 feet and for hundreds of feet their sides have been so effectually icepolished that not a grain of soil has found lodgment since the retreat of the glacier. Some of the rocky walls are separated from the waters of the fiords by narrow strips of low land, and in other places deltas and alluvial fans have been built of the waste from tributary valleys. In many instances the flat tops of the blocks between the fiords are covered with sheets of ice which rest on the surface like huge tablecloths and send tongues of ice in all directions down the valleys. Some of these valley glaçriers descend to within 268 feet of sea level. These ice masses are the remnants of the ice cap that formerly covered the entire country. At the present time, as the sheets push slowly out over the plateau, or the valley glacriers plow down the valleys, they filch from the land tons of rock which they grind into sand or clay or boulders and strew along their sides or deposit at their terminals, and everywhere over the land, ancient moraines are found and make up the only soil which covers the bed rock. In the west the lateral moraines line either side of the narrow valleys and in the broader lower eastern part the drift is scattered irregularly over the strongly undulating surface.

The high latitude and elevated surface of Norway suggest a rigorous climate, but the prevailing westerly winds and the warm waters of the Gulf Stream Drift counteract the influence of latitude and altitude. The annual range of temperature on the west coast at Stavanger is from 34.70 in January to 55.40 in July and as far north as Trondhjem only the upper ends of the fiords freeze. The winters are long and mild and the summers short and cool. Farther to the east the range increases until at Christiania and Lillehammer the winters are long and cold and the summers short and hot. The August days in Kongsberg and Christiania are as warm as the July days in Munich and Paris. The rainfall in Bergen averages about 75 inches; that of Christiania about 22 inches, but nowhere is there insufficient moisture for vegetation. The story is told that in Bergen horses shy at men without umbrellas. During the summer months in south Norway the sun rises between two and three o'clock in the morning and sets about ten or eleven at night; farther north the nights dwindle to an hour or two of twilight. During the winter the opposite is true, a few hours of daylight and a long night. Owing to the nature of the bed rock and the thin coating of mantle rock, the copious rainfall is held on the surface in numerous rock basins or runs away in countless streams. The entire surface is dotted with lakes, large or small, high or low, strung to-

gether by the connecting water courses. The uneven surface and the resistant rock account for the universal presence of waterfalls.

No large rivers are found on the steep western slope, and the Glommen is the only one that attains any size on the eastern side. The coastline is long and irregular, faced on the west by the bare rock walls of the mainland and on the east and south by the gently sloping forested lands. Fragments of the mainland, in an indescribable jumble of islets and headlands, make an immense archipelago called the Skjaergaard, which shelters navigation along the entire coast. The shore line is made up of a succession of harbors, and the warm, quiet waters of the fiords and sheltered nooks abound in fish. Seventy-five per cent of the total area is unproductive and twenty-two per cent of the remainder is forested. Forests of pine, spruce, and fir clothe the slopes to the snow line, and these are interrupted by stretches of maple, birch, ash, rowan, and beech. Where the forests have been cleared away and in the vales, the scanty soil produces a rich luscious grass. Every field and slope is bright with the common flowers. Buttercups, johnny-jump-ups, forget-me-nots, harebells grow in wild confusion, while every shady nook presents a fern hunter's paradise. At the present time the most characteristic wild animal is reindeer. Large herds of these useful beasts have been half domesticated by the Lapps and furnish their sole support. A fine species of elk and a few red deer furnish sport for the huntsman, and the government offers a bounty for the pelts of bear, wolf, lynx, and glutton. The finest of the wild fowl is the capercailzie, then the ptarmigan and hazel grouse. Within the Arctic Circle the eider duck thrives and is probably the most valuable of all the wild fowl.

Such is the setting of the country,—three-fourths of the land unproductive, nearly one-fourth covered with forests, the only fertile soil collected in the narrow valleys, long winters with many hours of darkness and but few of light each day, but little mineral wealth, a coast with many fine harbors, and surrounding waters filled with fish. The problem now is to show how these conditions have affected the occupations, development, and prosperity of the people.

Let us consider, first, the climate, which we find bracing and invigorating. The people are not enervated by extreme heat nor are they made lazy by a bountiful nature. What they live upon they must wring with effort from the stubborn land. On the other hand, the hammer of environment is not so hard that every energy is exhausted in securing meager food, shelter, and clothing. The Norseman in his struggle for existence brings into play every faculty, but at the same time there is some leisure for the growth of culture and for progress. The wits are sharpened by use but are not dulled by over exhaustion. The ironbound coast and the unproductive hinterland early drove the primitive Norseman to the sea for

his food. The sheltered waters of the fiords and the passages in the Skjaergaard were excellent training fields for the early navigators. The nearby islands were tempting goals for the most venturesome. Then it was but a step to those farther out, and this demanded a more seaworthy craft. The better ships and bolder spirits thus developed soon carried the sailors to the nearby countries, then to France, to Greece, to Iceland, and finally to America. Beyond a doubt, the barren lands, the excellent harbors, and the skirting islands were the controlling factors in producing the early Norsemen and the Vikings. Today with her small area and comparatively small population, Norway ranks in the class of navigators with Great Britain, Germany, and the United States. No other city in the world, unless it be Aberdeen, outranks Bergen in the amount of fish handled every year. Thousands of men are employed daily in catching and caring for the fish. Whole cargoes of codliver oil and cod, herring, oysters, and lobsters are shipped out every year, and fish is one of the staple articles on every Norwegian table. Among the early maritime nations, Norway takes equal rank with Phoenicia and Greece. Next to fishing and navigation as occupations, the industries of the forests take high rank. The slow growth of the Norway pine gives the wood a tough quality which makes it valuable as lumber and timbers for ships. The great ship building yards of the British Isles and Germany create a ready market for the supply. The numerous streams carry the logs from forest to mill or to coast with but little effort and expense. The abundant waterpower saws the logs into boards or grinds the blocks into paper pulp. The houses are built of timbers because the timbers are more plentiful, more adaptable, more accessible than any other building material. Thirty thousand men and boys make their living through the forest and forest products because the conditions of the country make these occupations inevitable.

The mineral wealth of the country is meager. Rich silver veins near Knogsberg and copper mines near Trondhjem are the only deposits so far discovered that yield ores in paying quantities. The silver has been worked since the 17th century, and the inhabitants excel as silversmiths.

The scanty soil on the rough surface will not yield grain sufficient to support the population. In many places the summers are not long enough to ripen the grain. But the soil does yield grass and fodder, which carefully harvested and fed to cattle, shows a good return; hence the universal dairy business and the quantities of milk and butter and the numerous varieties of cheese. Also from these conditions come the quaint and romantic custom of saeters or summer mountain pastures. We may attribute the small per cent of railroad mileage to the rough country and not to the lack of enterprise and progress on the part of the people. In a land where lakes and fiords abound and where easy and effective water transportation has been establish for centuries, men will not build rail-

roads that call for a great outlay of capital, supreme engineering skill, and infinite labor. Moreover, why does one want to ride on a rumbling dirty train through dark tunnels and along hair raising precipices when he may glide along in a boat over the quiet glassy waters of the fiords and lakes?

In the early times, the tribes or clans lived insolated lives in the remote valleys. Intercourse with each other was rare; life was hard and the strongest succeeded. A spirit of independence, of sturdy self-reliance, and of democracy developed very early. For many centuries the country was governed by numerous petty kings, each in his own system of valleys and separated from his neighbor by the bleak plateau. These kingdoms were not united until late in the 10th century and were never held together by a strong bond until the safety of the land against outside enemies demanded unity. Today the people are united by a strong bond of partriotism, but the old independence and democracy still prevail.

The wild strenuous life of the hunter, the sailor, the fisher furnished tales of adventure and the struggles between the petty kings made heroes and tales of romance. During the long winter nights the families gathered about the roaring wood fires and the best story tellers recounted their experiences or gave the reminiscences of their fathers. Out of this custom grew a prose literature of vigorous and realistic character. Sometimes the tales were given in the rude measures of the times and chanted in rhythm, the first poetry. The compelling, pure, strong literature of Bjornson and Ibsen did not burst forth in full fruit but is the growth of ages.

The intercourse with other nations through the Norsemen and Vikings and later through the navigators and traders lead to an early progressive education which has prevailed ever since, in spite of the ups and downs of government and history. I do not claim that geographical conditions are alone responsible for the fact that Norway has as small a percentage of illiteracy as any country in the world today, but I think we may say that these conditions have had some responsibility in the matter. Let us carry out the same thought in looking at the character of the native. He is superstitious; even the best of them half believe in trolls, faries, and gnomes, and why should they not? At least one half of the land is wilderness, peopled with mysterious beings; less than half the year has long sunny days when nature smiles and is kind, and more than half when the nights are long and cruel and the days cold and hard; gaining a livelihood in the early times was always attended with hardship and frequently with death; is it strange that the people sought explanation in the supernatural and endeavored to propitiate an unfeeling nature?

I have already shown how his independence, democracy, and patriotism were fostered by his surroundings. In a climate like this even the recreation must be energetic. No Norwegian would be content to spend

his leisure sitting on a hot stone in the white glare of the sun strumming a guitar. He must leap and run and slide, dance and shout in keeping with the wildness of the land and the tingling atmosphere. Perhaps the history, literature, music and character of man in Norway do not show the causal relations so strikingly as do the occupations and material prosperity of the people, but every one of these features and many others in greater or lesser degree bear the stamp of environment.

LAYING THE EMPHASIS IN TEACHING THE GEOGRAPHY OF ASIA

By R. H. WHITBECK,
University of Wisconsin, Madison

PHYSICALLY Europe and Asia form a single continent. In every other particular they are as far apart as the East is from the West. Europe seeks intercourse with all nations; Asia, until compelled to change, opposed such intercourse. Europeans are colonizers, conquerors, traders, and travelers. Comparatively few Asiatics ever go outside of their own provinces. Asiatics do as their fathers have done for two or three thousand years. Rural life in Illinois has changed more in 25 years than it has in Syria since the days of Solomon or in Interior China since Confucius.

Strictly geographical influences—climate, coast line, topography, situation—have exerted a strong influence upon the development of European nations. Such influences are of necessity, operative in Asia, especially the fact that the only parts of Asia capable of supporting a large population are separated from Europe by one or two thousand miles of desert. The isolation of India, China and Japan has favored the establishment of fixed social and religious convictions which blocked progress. The Caste System, contempt for things foreign, exclusiveness, ancestor-worship, have left their impress on Asiatic peoples. But Asia is awaking. The next hundred years are likely to be fraught with the most significant changes that any continent has experienced in that length of time.

We study Europe as a laboratory where men are busy, increasing knowledge, increasing productivity, improving processes, extending influence. Europe is a continent of factories, railroads, schools, armies and fleets. Asia is a museum, the repository of ancient customs, depressing religions, and antiquated methods.

In studying the geography of Asia, I believe the aim is not so much to memorize facts as to get pictures; to gain realistic impressions of the people, not uncivilized, but differently civilized. The foreign commerce of Asiatic countries is small, and calls for no particular emphasis. The leading five commercial nations of Asia all put together have less foreign

trade than the Netherlands alone. Our trade with all Asia is less than our trade with Canada, and Canada has 8 million people while Asia has eight hundred million.

ASIA AS A WHOLE

(1) *Its Great Size.*—Asia contains one-third of the land surface of the globe. Seventy-five countries as large as Germany could be carved from its area. Asiatic Russia in twice the size of all Europe. The Arabian peninsula, for example, is half as large as Europe.

(2) *Its Striking Contrasts of Topography.*—Asia has mountains nearly six miles high, whose peaks penetrate where the atmosphere is so thin that man cannot keep alive in it. Their valley bottoms are as far above the sea-level as are the tops of the Alps. There are intermontane valleys into which the Pyrenees could be dropped and lost.

Asia has the greatest extent of plains in the world. One quarter of the continent rises less above the sea-level than some of the offices in the Singer Building in New York. It has also the loftiest and most extensive plateaus. One-twelfth of the land rises above 10,000 feet; on the other hand almost as much more is actually below sea-level. All of the Great Lakes of North America could be poured into the Caspian depression and yet not make a Caspian Sea.

Toward the Arctic is a vast zone of tundra from which the frost never escapes, the treeless abode of a few half-frozen people. Great areas are arid steppes, "no man's land", over which wandering tribes drive their flocks in search of scanty pasture. The deserts of Asia exceed in area the entire United States, and nearly a third of the continent is so low and flat that it has no drainage to the sea.

(3) *Its Great Range of Climate and Products.*—Its extension gives it every variety of heat and cold. The coldest known place in the world is in northeastern Siberia. One of the hottest is in Arabia. The southern slopes of the Himalayas have by far the heaviest rainfall of any part of the world. Six hundred inches of rain sometimes fall in a single year, and four hundred inches is the ordinary fall. As much falls in an occasional single down-pour as Chicago gets in a year. Yet, some other parts of the continent go two or three years almost without a drop of rain. The result of all this is an enormous range of products. Asia yields substantially every product known to the commerce of the world. In Asia, Nature has concentrated her superlatives: hottest and coldest, highest and lowest, wettest and driest, most fertile and most barren, densest populations and most sparse.

(4) *Its Great Areas of Unproductive Land.*—Despite its size, the cultivated portions of Asia are *relatively* small, and must, under present climatic conditions, remain so. One-half of Siberia, an area nearly as large as Europe, lies north of the sixtieth parallel, and, with a continental

climate, is too cold for agriculture. Of the remainder, one-half is too dry for farm crops. More than half of the Chinese Empire is desert or nearly desert. Only a minor part of south-western Asia has sufficient rainfall for crops, either with or without irrigation. Probably Europe, small as it is, has nearly as much land actually under cultivation as has Asia, five times as large.

(5) *Its Vast Population, Very Unevenly Distributed.*—The average density of population in Asia is only half that of Europe, yet, a single division of the Chinese Empire, China proper, has nearly as many people as the whole of Europe. Half of the people of the globe live in Asia, but seven-ninths of these are huddled in the southeastern quarter of the continent and the neighboring islands. The remaining three-quarters of Asia would give each family that dwells in it a square mile of land, and in much of it each person might have a square mile. On the other hand, in the fertile flood plains of the southeastern rivers and in Japan, the population is very dense. The vast majority of people in China, Japan, and India, cultivate little pieces of land, and they have little money with which to buy anything; 70 per cent of the farmers of Japan cultivate less than 2½ acres each. They must compel their patches of land to feed them. If a crop fails there is suffering. Belgium, Saxony and England are as densely populated as China or India, but great numbers of their people earn money by manufacturing, mining, and transportation, and with their earnings they may buy imported food. Millions, in interior China, never tasted food that did not grow on Chinese soil, while more than half of the Londoner's every meal comes from over the sea.

(6) *Government, Religion, Civilization, Races.*—Asia belongs to the past, the far remote past, when despotic governments and walled cities were the rule. It has been a cradle of civilization and from it, civilizing influences moved westward, usually carried by the migrating peoples who chose to leave or were forced to leave their Asiatic abodes. For three thousand years the ever-evolving, ever-progressing civilization, languages, and one of the religions, of Asia have slowly pushed westward around the world, and are now returning to the continent that gave them birth. Japan, the first of the oriental nations to accept western ideas, has applied them with a thoroughness and celerity that have commanded the admiration of the world. We must not under-rate the capacities, or the possibilities of the Asiatics. They are neither stupid nor lazy. Their better classes are intellectual, their artisans are skillful, their architects have produced some of the world's most beautiful buildings. The Taj Mahal of India, the silks and porcelains of China, the rugs of Persia, the inlaid work of Japan, tell of the taste and skill of their artists and workmen. The great wall of China is a marvel to modern engineers. Damascus made the best steel, and Arabia yet breeds the finest horses in the world. All this

is true, and it is also true that millions upon millions of Asiatics are ignorant, hungry, and hopeless.

Asia, probably Tibet, was the original home of the great Mongolian race, which now forms a third of the world's population. Most of the Mongolian race live in the southeastern third of Asia and the nearby islands. The white race is more numerous and more widely dispersed over the world. In India, in southwestern and western Asia and in parts of Siberia the Caucasian race predominates. Asia not only was the cradle of the world's religions but it is the present home of practically all the follers of Buddha, Brahma and Confucius and of the major part of the Mohammedans. While Christianity originated in Asia, it has never been an Asiatic religion.

THE COUNTRIES OF ASIA

Siberia will call for little attention beyond what it receives in connection with European Russia, and with Asia as a whole. Korea will naturally be included with Japan. India, China, and Japan will properly claim most of the time which is allotted to the teaching of the countries of Asia.

It is my opinion that the method of treatment employed when teaching Asiatic countries should differ considerably from that used for North America and Europe. Less time is allotted to Asia. The industries are few and simple; life is far more primitive. Comparatively few cities need be even mentioned. Foreign trade is relatively small in value and variety. Seemingly the thing to do is to give as vivid pictures as possible of the way these people live; their homes, their towns, their characteristic ways of doing; the few lines of industry in which they are particularly skillful, a little about their religions, education, methods of travel and transportation, the changing attitude toward other nations and toward western ideas. I would treat physiography briefly, touching only on those points which have as marked influence upon climate and upon human conditions.

THE EMPIRE OF INDIA

Three points in its physiography deserve attention:

(1) The plateau nature of the peninsula, giving a regular coast with almost no natural harbors.

(2) The great wall of the Himalayas, precipitating in enormous quantities the moisture of the southwest monsoons, and supplying water and silt for the Ganges, Indus and Brahmaputra. This mountain wall protects India from the chilling influence of north winds much as the Alps protect Italy.

India is made up of "many distinct and independent communities owning no brotherhood of religion, language, race, or social intercourse."

There are innumerable sects but the *caste system* is general. A great number of languages and dialects are spoken. Two-fifths of the territory is not *directly* administered by the British but is under native chiefs. A handful of British rule India. There are 3000 natives to every Briton. Ninety-five per cent of all those holding official positions are native Indians.

Most of the people till little pieces of land, living in small villages. Not over five per cent of the people live in cities. The people seldom move from one place to another, but are peculiarly attached to the place of their birth. The factory system has begun in a few cities. In the valley provinces there are over 500 people to the square mile. In some provinces there are as low as 12 to 30 to the square mile.

Calcutta, Bombay, Madras, Benares and perhaps Delhi deserve brief individual treatment.

THE CHINESE EMPIRE

(1) *The Large Area.*—It is larger than all Europe, a third larger than the United States, and twenty times larger than France.

(2) *Its mountainous surface.*—Some of the ranges are of great extent. The country is a series of ranges and valleys, without extensive plains except flood plains. Tibet is a mighty plateau, little known.

(3) *The great deserts and arid lands.*—Nearly two-thirds of the empire is too dry for crops and much of it is desert. The plateaus, mountains and deserts which intervene between China proper and the rest of Asia have been effective barriers, hindering communication, shutting China away from the world, promoting exclusiveness, if not actually causing her to keep apart.

(4) *The rivers and flood plains.*—The latter are very fertile, highly cultivated and densely populated. The Yangtze is the great highway of the Empire. Ocean steamers ascend the river 700 miles to Hankow and smaller steamers ascend 1100 miles. The floods of the Hoang-Ho are appalling, sometimes killing as many as a million people. Its lower course has changed eleven times in 2500 years. Much of the internal commerce of the empire is carried on in river boats of every description.

(5) *The rich but undeveloped mineral resources.*—China is said to be among the richest of lands in coal, one of the chief factors in the building of an industrial nation. Because of poor transportation facilities and opposition to modern inventions, the mines are largely undeveloped.

(6) *The productions* might be practically like those of the United States, but the Chinese have for centuries been producers of tea, silk and rice. These are their great staples. Rice for food; silk for their own hand looms, and for export; tea for the world and particularly for the overland trade both north and west.

(7) *The enormous population.*—If the people of the Chinese Empire were evenly distributed, the population would not be especially dense; less

so than in Germany. However, some seven-eighths of the 400,000,000 people are huddled into China proper. In the rest of the empire, the people are thinly scattered and largely pastoral or even nomadic. In the southeastern quarter, there are more people to the square mile than in any other large area in the world. They live by thousands in house boats on the rivers. Every available patch of land is cultivated. Soil is often carried in baskets and spread over rocky places. The steep slopes are terraced sometimes as high as 8000 feet up the mountains. The marshy lands are reclaimed for rice fields. Tens of thousands live by fishing. Farming is the most honored occupation and the vast majority of the people are small farmers.

(8) *The Chinese people.*—The Mongolians were originally immigrants into China. They came thousands of years ago from Western Asia and have gradually absorbed or exterminated nearly all of the former peoples, and have slowly pushed their boundaries outward to their present limits. The present rulers are of Manchu origin, not Chinese. As a race, the Chinese are exceedingly industrious, thrifty, patient, and peaceable, able to do the hardest kinds of work on a meager diet, shrewd tradesmen, devoted to their ancestors and unwilling to do anything not practiced by them.

JAPAN

Five points call for emphasis:

(1) The remarkable transformation of the nation in the last half century.

(2) The traits of a people who are capable of such progress.

(3) The physical limitations of the empire, the rapidly growing population, the national ambition, the inevitable expansion of territory and possible conflicts.

(4) The hoped-for industrial and commercial expansion along the lines already followed by Great Britain.

(5) The present and future relations between the United States and Japan.

Two distinct lines of interest will be developed in connection with Japan. Young pupils will find the chief interest in the peculiar homes of bamboo and matting, the scanty furniture and few utensils, the odd dress of the women and children, the travel by jinrikisha or chair, the pagodas and strange religion, the customs and manners and other points pertaining to the daily life of the people. Older pupils, and particularly boys, will have heard or read about the late Russo-Japanese war, and will read in the press of the imaginary but much discussed danger of war between Japan and ourselves. These pupils should know the leading facts about the rise of the New Japan to the rank of a world power. They should

know that the Japanese are a people of proved ability, dauntless courage in war, unswerving loyalty to country and emperor, boundless ambition, restless energy, and yet compelled to live in a little island empire, the size of California, only an eighth of which is arable, with valuable but limited mineral resources.

The pupil should see that such a land can not long contain such a people: that the war with Russia was unavoidable if Japan preserved for her increasing population an outlet into Korea and perhaps Manchuria; that the absorption of Korea by Japan was practically inevitable; that further territorial expansion seems certain and hence the suspicion by some people that Japan desires the Philippines; that Japan has coal and some metals, that her people are mechanically inclined, and that she aspires to become the manufacturer for the East and thus, as in the case of England, be able to exchange the products of her mills for the food stuffs and raw materials which her small area is incapable of supplying.

CURRENT EVENTS AND GEOGRAPHY

By MARY E. KELTON,
Ely School, Greenwich, Conn.

THE study of the earth in its relation to man has established its right in the school curriculum. The question that now confronts us is how to make this subject of geography most vital.

The press is universally making geography a leading topic in its pages and the editorial columns frequently furnish valuable notes for a geographical text. One leading New York paper has gained popularity through such sketches in its Sunday issue. When the great financial problems of the world are brought face to face with the geographical causes that effect them, it must be in the pages of the daily press that the geographical text has its most vital significance. This power of the press in the affairs of men places the current news item as an important factor in the geography instruction of the elementary school.

The value of place location proves itself when the boy and girl begin to read the daily paper, and its chief significance is never apparent before. Memorizing capitals, a questionable exercise in the eyes of the psychologist, then becomes easy. Guthrie has a meaning to the boy who is interested in the current events of Oklahoma, since the news items of its affairs of state are dated from its capital. The unpronounceable Cetinje holds its place in the mind when Montenegro becomes an interesting topic in the pages of the daily paper.

A systematic treatment of current events may produce a combination of exercises relating to civil government, history and geography as well as

maintain its importance in developing the power of oral expression, so essential in the mastery of English. This plan may satisfy both the one who extols and the other who condemns a wholesale system of correlation.

It may not be out of place here to give some concrete examples of our attempt to make the current news item a stimulus in the geography lesson.

In the Horace Mann school, a pupil who shows certain ability in his one minute speeches before the English class, chose as his topic, "The Cotton Picker," as described in a current number of the World's Work. The essentials in this long article were so carefully chosen and so clearly stated that he won the attention of the entire class. Questions followed that created a nucleus for elementary research. Other news items relating to the cotton industry were contributed. The discussion led to the following deductions:

"The cotton picker is, at present, best adapted to a rolling surface. It will increase the acreage of cotton in certain regions that are not climatically suitable for the home of the white man."

"Germany has a small area, in her colonies, devoted to cotton culture."

"German Cameroon is the colony that is well adapted to cotton growing but it is not the home for the white man. Its surface makes it suited to the cotton picker and this may make Germany a rival in the cotton markets of the world."

The weekly reports of the Stock Exchange in one of our daily papers brought up a discussion of the climatic conditions in the United States. February notes from the Texas cotton fields made the relation of climate to latitude more vivid; while the March notes from Kansas, predicting a change in the wheat quotations on account of the dreaded drought, gave significance to a review of countries similarly affected by a continental climate.

An illustrated edition of a Duluth paper was received while the coal and iron industry was the topic of study in the geography class. Pictures of the steam shovel, the great ore docks and other facilities for handling this important article of traffic on the lakes, covered its pages. There were also descriptions in detail of the comparative values of the surrounding hills in their mineral contents. Other editorials pointed out the successful transportation of this ore to the distant coal fields of the prairies and the Appalachians. To these were added words of prophecy relating to the outcome of a new steel plant, near the ore fields, to which the coal must be brought as a return cargo.

Maps were first made, as a home lesson, by the entire class. In these were shown the Lake Superior ranges and the several shipping ports. The receiving ports, near the coal fields, were also indicated. By means of the map scale, the relative distances between the ore fields and the fuel regions were estimated.

In a second home lesson, clippings were distributed in preparation for the one minute recitations that were to accompany the lantern slides, similar to those pictures we had studied in this newspaper.

The lantern slide lesson was then entirely in the hands of the pupils, who recited on the topics as they related to the pictures thrown upon the screen.

This use of the picture lesson, as a summary of any topic of instruction, puts the pupil instead of the teacher into the foreground. Any means of accomplishing this result seems to be a helpful sign of progress in our elementary schools. Possibly geography offers greater opportunity for such individual development than do some of the other branches in our school curriculum.

This plan of handling the current news item has proved itself of some value, at least, by turning the pupils' attention to the practical affairs of men as well as by stimulating a more vital interest in geography.

WHAT IS GEOGRAPHY?*

WHEN one hears a geography lesson as it is conducted according to the present course of study in the Chicago schools, one naturally asks whether geography is every thing, or anything. Certainly almost anything is considered raw material for geography. The fauna and flora, the mineral deposits, the rivers and roads, the rainfall, the industries and sciences of man,—all are touched upon with more or less fullness. Hence the query as to whether geography is *everything*. If the content of the geography lesson were assigned to the different sciences from which it is drawn, would there be a residuum that we could call geography? Hence the pertinence of the query as to whether geography is *anything*. This dilemma furnishes the basis for the charge, frequently made, that the geography of the schools is a hodgepodge of miscellaneous material without organization according to any definite principle. In particular, the recent emphasis in geography on the historical and social facts connected with a country or region has led to protests from the teachers of history and the opponents of over-hasty sociological generalization. Nevertheless, the dilemma is not so difficult of solution, nor is it true that there is no clear principle of organization to govern in the selection and arrangement of material. The two elements of geography on the content side are, first, the facts about the earth as the best known and most accessible of the heavenly bodies, the material home of man, and second, the human life that goes on in this material home. The first set of facts alone would ap-

*Reprinted from an editorial in the June, 1911, Educational Bi-Monthly, Chicago.

peal to the intellectual instinct of curiosity and might conceivably, on this account alone, be treated in the curriculum of the elementary school. But the basal reason, if not the primary starting point, for the study of geography is found in the second set of facts, the general forms of human activity in a given region with their manifold appeal to human interest. Now geography aims to consider these two sets of facts together in their real relationship. It does not attempt to give the physiographic facts of the earth with incidental reference to the human facts, nor does it attempt to study human society with an illuminating physiographic introduction. It does attempt to study the physiographic facts and the human facts in their actual relation.

Moreover, it is of the greatest importance to observe that this relationship, which forms the real content of geography, is not an abstract one set up by science in the furtherance of its ends, but the real, concrete relationship of co-existence. The terms of the relation are not *brought* together, they are *found* together. This, then, is the organizing principle underlying geography, that the actual physiography and society of a region should be set forth as they *are* in relation. If one keeps his eye steadily fixed on this aim, there will be little danger of wandering too far into the fields of physiography or sociology.

NOTES ON ECONOMIC GEOGRAPHY

By ALBERT PERRY BRIGHAM,
Colgate University, Hamilton, N. Y.

TO give instruction for securing pure water on farms, is the object of Water Supply Paper 255, published by the United States Geological Survey. It appears that polluted waters and resulting typhoid fever, are more common in the country than in the city. The farmer who reads this paper will learn much about the sources of water, about the ways in which it moves in different kinds of soil, sub-soil and rock, and about the location of springs and wells, as well as the protection of the water from contamination. Information is also given concerning the construction and care of cisterns. Cistern waters may be made useful where the well waters are hard, also in villages which have no public water supply, and in regions where little ground water is available.

Extensive forests have in past years been planted on the sand dunes of Gascony along the shores of the Bay of Biscay. These forests not only hold in place the shifting sands, but form of themselves an important source of fuel, of telegraph poles, and, since the trees are pines, of turpentine and rosin. Thus the region has been made prosperous and populous by intelligent efforts to reclaim the land.

The Canadian Experimental Stations have for many years sought to produce varieties of apples which should be hardy enough for a severe northern climate. Experiments began in 1887, with the Siberian crab-apple, which was crossed with other hardy kinds. Progress has been so marked, that the director expresses confidence that in a few years, apples of good hardiness, size and quality will be available in regions where the ordinary apple cannot be grown.

One of the most valuable papers published by the Weather Bureau is Bulletin V, Frost Data of the United States. Five charts are included, as follows,—average date of the last killing frost in spring; average date of the first killing frost in autumn; the latest date in which a killing frost has occurred in spring; the earliest date on which a killing frost has occurred in autumn; the average length of the crop-growing season. These facts are shown by maps of the United States bearing red lines which pass through places having the same conditions. The map showing the length of the crop-growing season shows vividly how other conditions may neutralize the effect of latitude. Thus the south shore of Lake Superior shows 140 days while *farther south* in the forest region of Wisconsin the period is 100 days. In like manner, the south shore of Lake Ontario shows 170 days, and a hundred miles south the uplands about the head of the Genesee River, show 130 days. Again, northern Maine, in latitude 47 degrees, has 120 days and northern Washington, approximating latitude 49 degrees, has, near Puget Sound, 182 days. The interior of Washington however, in the upland region near the international boundary shows less than 100 days. The chart is full of profitable lessons concerning the climatic effects of altitude and of bodies of water, and is of the utmost value to the student of American agriculture.

The water resources of a country have a vital bearing upon its industry and commerce. The full recognition of this fact is recent and it is now time to organize the subject as a part of geographic instruction. One of the chief uses of running water is for the development of power for manufacture and transportation. It is not enough to consider Niagara, the streams of the southern Appalachians, or of New England and the Cascade Range. A multitude of small water powers await utilization. The geological survey of Tennessee devotes the first issue of a monthly bulletin on the resources of that state, to this last phase of the subject. Among many cases cited is that of a farmer who has built a small dam and electric plant on the Oriskany Creek in Central New York. With this power he lights house and barn, heats the house in winter, and propels fans in summer. He runs a circular saw and other machinery, milks the cows, runs the separator, churn, ice-cream freezer and grindstone, cooks the food and turns the egg beater, cream whipper and sewing machine. As if to remove all the labor of housekeeping, the stream pumps

the water and operates a vacuum cleaner. The author of the paper well says that to use coal is to destroy it, but water power is a permanent resource.

The Special Board of Engineers, reporting on the improvement of the Mississippi River, favors the abandonment of the project of a 14-foot channel, and argues that a 9-foot channel is sufficient for all prospective traffic. The greatest commercial rivers of Europe, such as the Rhine, Elbe, and Volga, offer depths ranging from four and one-half to eight feet. Some of the newly designed Mississippi River freight boats are able, it is said, to carry 1,200 tons with a depth of four feet, and 4,000 tons with nine feet of water.

In "Mineral Resources of Alaska" published by the United States Geological Survey, Mr. Alfred H. Brooks, who has long been in charge of Alaskan Surveys, says that the lack of cheap fuel is the one great hindrance to the mining interest of the Territory. With coal at $8.00 to $20.00 per ton on the seaboard even mines at tide water are hampered. Railway building is at the same time retarded for lack of assured tonnage and cheap fuel, and inadequate laws tend to throw the gold placers into the hands of speculators rather than miners. During the year 1910 the output of gold decreased, but much "dead work" was done, which will count in the future. The total mineral production of Alaska for 1910 is estimated at $16,925,000.

GENERAL SCIENCE IN RELATION TO PHYSICAL GEOGRAPHY*

By EVERETT P. CAREY

THE movement in favor of preliminary high school science course in California has been accelerated, in part at least, by the following conditions:

(1) The almost entire lack of nature study in the grades.

(2) The too formal presentations of the high school sciences, more especially chemistry, physics and physical geography.

(3) The over emphasis of laboratory work along technical lines.

(4) The failure to segregate pupils on the basis of their ability or attainment.

Will the introduction of a general science course, even if practicable, paliate or correct any of the above evils?

The course is designed for the first year in the high school and so comes into direct conflict with physical geography, which subject it will supercede or push into later years to be taught as a more formal subject on a par with chemistry or physics. Either alternative is bad.

*Abridged from an address delivered before the High School Teachers' Association of San Francisco.

Granting that the course in chemistry and physics are too formal and, in many cases, too difficult, and too remote from the every day phenomena of life, how can this best be remedied? In the most simple and natural way, namely:

By elimination, and by simplification of the subject matter.

By segregating the stronger pupils from the weaker; in any event, by adapting the work to the ability or previous experience of the pupil.

An effort was made in this association a few years ago in favor of a simplified introductory high school course in physics, to be followed in later years by the more technical course. Such preliminary courses were adopted in certain high schools for physics and chemistry respectively, and have since been abandoned in favor of a general course to cover the entire science field. There is no better excuse for a preliminary course in connection with science than there is for a preliminary course in Latin, Greek or history. Just here we might note the failure of such a general course in history, recently tried in the Lowell high school. We already have in physical geography a course which is informative, broad in scope, general and elementary in character; a course embracing much of the same subject matter as a course in general science; a course in which the every day phenomena of nature are taught in their natural settings; a course adapted to the field as well as to the laboratory; a course above all with coherence, with a strong unifying principle, namely, the influence of the inorganic environment on life, particularly on man.

What is to be gained by replacing such a course with one having no inherent character of its own, no correlating principle? It is clear that a course in general science would borrow from all the science subjects now taught in the high schools, and that the pupils would have presented to them a mixture of more or less uncorrelated material, and that they will miss the fundamental aim, *the obtaining of a scientific view point, or attitude of mind.*

Not the magical manipulation of experiments one after another nor the accumulation of facts, but the cultivation of initiative, of mental independence, of the scientific spirit,—these are the important things in a science course, and where much is attempted superficially and where the teacher's lectures and demonstrations take the place of the student's correlated motor and psychic activities, the cultivation of such an attitude becomes difficult, if not impossible.

Let us consider in some detail the subject matter and manner of treatment. Take, for example, the treatment of *water.* How should it be presented to the pupil? The advocates of general science will say, "Have the students construct a simple electrolysis apparatus, pass the electric current through acidulated water, and determine the properties of the resulting hydrogen and oxygen." This, of course, enters directly the fields

of chemistry and physics, for this experiment never fails of presentation in one, generally in both of these courses. This repetition in itself is not unprofessional nor a cardinal sin. Should we not rather emphasize *water* from the standpoint of its distribution, its relation to life and man in the form of rain and dew, rivers, lakes and springs; in ocean currents as they affect climate, crops and the industries of man; in water-falls as scenic objects and sources of power; in irrigation; in the disintegration and removal of rock material; in the formation of valleys and flood-plains; in its transformation from barriers in the form of lakes and oceans into pathways of trade and commerce? All this is geographic, including the necessary and inseparable relation to physics in regard to evaporation, condensation, dew point and gravity, all of which should be presented, not as an individualized experimental process, which is too frequently the case in science teaching, but in direct conjunction with natural phenomena.

Physical geography touches the principles of physics, chemistry, and biology and relates them to something tangible. But just here the advocate of general science says, "But, we intend to annex physical geography, in fact we intend to make it a sort of nucleus of the new science course." The reply is, physical geography is not open to annexation. It already has a legitimate interest in a wide extent of territory, and a rather independent form of government. It seems evident that two such world-wide constituencies can not occupy the earth at the same time. If general science can demonstrate its superiority physical geography will retire.

Take another illustration from biology. Shall we treat of plants from the point of view of adaption to soil, moisture, food supply, barriers, air, climate, topography? If so, the treatment is geographic. Consider, for example, the cactus in relation to arid conditions, its spines, consolidated form, range, root system, all this falls within the field of geography. Turn to the atmosphere, the rocks and minerals, the earth itself, and we remain in the legitimate field of physical geography.

But it is said that physical geography should be pushed forward to take its place in later years of the high school along with chemistry and physics as a more specialized science. The hand of the specialist has already been too evident in the organization of the high school sciences and this tendency in the case of physical geography can not be too strongly deprecated. The broad scope of physical geography, its phenomena centering as they do in the earth, its informational character, above all its treatment of phenomena always open to observation, its human relationships,—all entitle it to be actually what it is historically, the mother of the sciences.

The Committee of Ten were unanimous on this point, namely:—that an elementary treatment of physical geography should precede the other sciences given in the high school. The committee on Geography of the N.

E. A. of 1909 also recommended that the subject of physical geography should be taught during the first year of the high school.

Dr. H. W. Fairbanks in the June (1909) number of the Journal of Geography, in an article entitled *"Physiography, an Elementary Science Course in the High School"* gives a clear presentation of the broad, fundamental correlating character of physical geography. This characteristic is highly important. The geographers who have emphasized the specialized viewpoint for high school physical geography have done violence to the subject as well as an injustice to science teaching in general.

EXTRACTS FROM THE REPORT OF THE COMMITTEE OF TEN ON GEOGRAPHY FOR SECONDARY SCHOOLS

"It is thought that physical geography should be taught as the last geographic course previous to the high school and that there should be introduced into the high school course either physiography, geology or meteorology as the representative of the geographic line of studies."

Dr. Chas. W. Eliot who opposed this specialization of the geographic studies states in his minority report:

"In my long experience as a teacher of natural science I have found the study of physical geography always to attract and often to charm the mind of the student. Moreover physical geography forms the natural introduction to elementary natural science since it treats of the causes and effects of the things that are constantly before the child's observation. "The proposition to change all this," he goes on to say, "for the doubtful and untried advantages of a so-called new study is, I think, unwarranted, and means retrogression and not progression. I regard elementary geography as practically identical with elementary natural science, which I firmally believe should form as essential a part of primary education as either language or number. The child, in any judgment, should be taught the elementary facts of natural science along with its letters. The study of nature should form a large part of its first school work if indeed not the only part."

In connection with this inquiry in regard to general science I have tabulated the opinions, as incidentally expressed, concerning its relation to physical geography. Out of 76 answers received:

In favor of general science	27
Opposed to general science	18
In favor of general science but offering a broad outline essentially geographic	12
Need of general science not imperative; conflicts with other sciences	3
Non-committal	3
Open to conviction	2
Geography should be the general science course	2

In favor of general science in conjunction with physical geography	7
In favor of general science along independent lines	1
Tried and thrown out because of inefficiency	1
Total	76

In conclusion I respectfully submit this report as opposed to the general introduction of a general science course into the high schools for the following reasons:

(1) The course, in the nature of the case, would be too broad, vague, general and superficial to be efficient. It would rest on an unsound psychological basis.

(2) A sufficient number of qualified teachers could not be found to teach such a course and the universities do not supply them.

(3) It is unrelated to the high school science courses now offered, which have differentiated along natural lines.

(4) It is in direct conflict with physical geography as a first year beginning science.

(5) It will introduce confusion and lower the standards of work in the universities.

A STUDY OF THE GREAT INDUSTRIES OF THE UNITED STATES*

1. The United States is the greatest agricultural nation; produces 1-6 of the crops of the world. What conditions make this possible?
2. 1-6 of the total area of the United States is under cultivation. Where are our chief agricultural states? What parts of North America are unfitted for farms? Why?
3. 75 per cent of the world's corn is raised in the United States. Where is our "corn belt?" Why there? Only 1-10 is exported. What is done with the remainder? Why?
4. We produce ¼ of the world's wheat. Where is the winter wheat belt? The spring wheat belt? Where are the flour milling centers? Other large wheat producing nations? What countries buy most of our export wheat? What advantages have we over most other countries in agriculture? Are our agricultural exports increasing? What of the future?
5. We produce ¾ of the world's raw cotton. In what states? What proportion is exported? Where sent? Our chief competitors?
6. What climatic conditions are most favorable to corn? Wheat? Cotton?

*Based upon Chapters XIII-XVII in Gannett, Garrison and Houston's Commercial Geography.

7. What part of the raw sugar which we use do we produce? Where? Where do we buy the rest?
8. We produce most of the rice that we use. Where? How is rice grown?
9. We produce ⅜ of the world's tobacco. Chiefly in what states?
10. Where are the great forest regions of North America? Leading lumber states?
11. Where are most of our great pulp and paper mills? Furniture factories? Why?
12. The United States leads in raising live stock (sheep excepted). Reasons?
13. In what parts of the United States are the great cattle ranges? Why there?
14. In what region is the fattening of cattle extensively carried on? Why? The fattening of hogs? Chief live stock markets?
15. What countries buy much of our meat? Our chief competitors?
16. Where in the United States are sheep extensively raised? Why there? Do we produce sufficient wool for our own use?
17. Where are our cod fisheries? Salmon? Shad? Oyster? Seal?
18. Our mineral industries about equal those of all the rest of the world. What are our leading (5) metallic minerals? Where mined?
19. We produce ⅓ of the world's iron, ½ of its copper, ⅓ its silver, ⅓ its coal, ¼ its lead, ½ its petroleum.
20. Where are the leading coal regions of the United States?
21. Where are the leading oil regions of the United States?
22. Where are our great iron mines? Where is the most of our iron smelted? Why?
23. Show the relation of our agricultural and mining resources to our national prosperity. We derive nearly ten billion dollars yearly from these two sources.
24. The United States has 40 per cent. of the railway mileage of the world. Chief factors in producing this? Relation to our industrial activities?
25. Name some of our great railway systems, east, south, west, middle west.
26. Chief facts about our merchant fleets engaged in (a) foreign trade, (b) coast trade, (c) lake trade?
27. The United States leads the world in manufacturing; double Great Britain. Account for it.
28. Chief woolen manufacturing states? One city makes ½ the carpets made in the United States. What city is it?
29. What state and what city lead in cotton manufactures? Reasons? Cause of rapid growth of cotton mills in the South?

30. The United States uses ⅓ of the world's raw silk. Why so much?
31. What state and what city lead in silk manufacturing? Reasons?
32. Pennsylvania, Ohio, and Illinois produce ¾ of the pig iron and 9-10 of the steel. Reasons?
33. Ship-building centers around Delaware and Chesapeake Bays. Reasons?
34. Illinois, Kansas, and Nebraska lead in slaughtering and meat packing. Reasons? What cities lead?
35. Minnesota leads in flour milling. What city leads? Any reason?
36. Massachusetts leads in boot and shoe making. Reasons? Leading cities?

TO SET YOUR WATCH BY THE SUN

By WILLIS E. JOHNSON,
Northern Normal and Industrial School, Aberdeen, S. D.

WE laugh at the story of the traveler in the Alps who had recently purchased a fine Swiss watch and when out to observe the sunrise kept looking at his time piece and expressing anxiety lest the appearance of the sun be delayed. It is a poor watch, however, that gains or loses as much time in a day as the sun ordinarily does. Not only is the time of sunrise and sunset constantly varying, but the time elapsing from sun noon to sun noon again is sometimes more and sometimes less than twenty-four hours. To be sure, the sun gains as much in one season as it loses in another, and so, unlike the watch, ultimately comes around exactly "on time."

The reasons why the sun is such an erratic time-keeper are not very difficult to understand but are of too technical a character to come within the limits of this article. The explanation may be found in a mathematical geography or an astronomy. However, that the sun is sometimes fast and sometimes slow, at times as much as sixteen minutes, may be assumed and must be borne in mind if one would set his watch by the world's great time-keeper. The amount which the sun is fast or slow at different dates is shown in the table at the end of this article.

One other fact must claim our attention before we are ready to regulate our timepieces by the noon sun. With a very few exceptions people in the United States do not attempt to keep "sun time," not even the average sun time, but practically all timepieces are regulated according to a system of standard time. According to the present system, which was adopted in this country in 1883, people living east of the Alleghenies set their watches twelve when the shadow is north (if the sun is on time) at the 75th meridian; timepieces in central United States indicate the average sun time of the 90th meridian; those of the mountain region of the west, that of the 105th meridian; and those of the Pacific seaboard, that of the 120th meridian.

Notice now what follows from this keeping of standard time. When the sun in its apparent westward journey looks down upon Boston (longitude 71°) and says noon, and the shadow is north, the people of Boston say, "No, it is not 12:00 o'clock yet, and won't be until you reach the 75th meridian." Now it takes the sun four minutes to sweep over one degree of longitude and Boston is four degrees east of the 75th meridian, so sun time in that city is 16 minutes ahead of clock time. When the genial rays of the sun pour down upon Pittsburg and north shadows there indicate that it is noon by the sun, the clocks indicate 20 minutes past 12:00, for Pittsburg is 5° west of the 75th, or standard-time meridian. Sun time at Pittsburg is 20 minutes behind clock time. The case is precisely similar in places which use Central time but which are east or west of the 90th meridian, and in other belts as well. For example, Chicago is 2½° east of the 90th meridian. The sun time there is thus 10 minutes (4 minutes for each degree, and 2½ x 4 min. = 10 min.) ahead of clock time. Seattle is 2¼° west of the 120th meridian, from which Pacific time is reckoned, and hence at that city sun time is 9 minutes behind clock time. Philadelphia is on the 75th meridian, hence sun time is the same as clock time. New Orleans and St. Louis are on the 90th meridian and clock time agrees with sun time. Similarly, Denver is on the 105th meridian and the same agreement is shown between the clock and the sun. Now if this is clear, note that the statements in this paragraph are true if clock and sun are "on time."

Let us now review the foregoing paragraph and note the effect of the irregularity of the sun. If you are at Boston and the sun is neither fast nor slow, when the shadow is north you may set your watch 16 minutes before 12:00, since sun time is that many minutes faster than standard time there. But on only four days of the year is the sun neither fast nor slow. Suppose the sun is 5 minutes slow; then the shadow will be north 5 minutes later than usual, or 11 minutes before 12:00. Suppose the sun is 5 minutes fast; the shadow will be north 21 minutes before 12:00. Suppose you are at Seattle and want to set your watch by the noon sun when the sun is 14 minutes slow. If the sun were on time, the shadow would be north at 9 minutes past 12:00, but, being 14 minutes slow, it will be north 14 minutes later than that, or at 12:23. When the shadow is north, under these circumstances, you know your watch should indicate 12:23, and set it accordingly.

The general principles now being clear, let us learn how to determine the equation of time, or how fast or slow the sun is, for any day of the year, from the table. The numbers at the top of the columns are the dates, only every fifth day being given. "S" stands for slow and "F" for fast, and the numbers indicate how many minutes the sun is slow or fast on the given date. Thus on January 1 the sun is slow 3.3 minutes, on January 6 it is slow 5.6 minutes. For dates between the 1st and the 6th,

a simple calculation will show the proper number. Since the sun is slow 3.3 minutes on the 1st and 5.6 minutes slow on the 6th, it must have lost 2.3 minutes in five days, or .46 minute each day. On the 2nd it will be 3.76 minutes slow, on the 3rd it will be 4.22 minutes slow, etc. We are now ready for the rule:

1. Find the difference between your longitude and your standard time meridian (the 75th if you use Eastern time, the 90th if you use Central time, etc.).

2. Multiply the number of degrees thus obtained by 4. This gives the number of minutes by which local time differs from standard time. Add this number to 12:00 o'clock if you are west of the standard time meridian, or subtract it if you are east of it. This gives the time when the shadow is north if the sun is neither fast nor slow.

3. Find the equation of time for the day when you make the experiment. If fast, subtract that time from the answer obtained in step 2; if slow, add. This gives you the time when the shadow will be north on that date. Example. Suppose you are at Boston January 1. Longitude of Boston, 71°; standard time meridian used, 75°. Step 1: 75°—71°= 4°. Step 2: 4×4=16. 12:00—16=11:44. (When the sun is neither slow nor fast the shadow will be north at Boston at 11:44 A. M., eastern standard time.) Step 3: The equation of time for January 1st is 3.5 minutes slow (see table). 11:44+3.5=11:47½, the time when the shadow will be north at Boston on that day.

While the following table is calculated for mean solar noon of 90° west of Greenwich for the year 1910, it will not vary greatly for several years. The letters S and F indicate whether the sun is slow or fast, the number giving the minutes to the nearest tenth. The equation is given for the 1st, 6th, 11th, 16th, 21st, 26th, and 31st of each month. Thus January 16 the sun is slow 9.8 minutes, or 9 minutes and 48 seconds.

EQUATION OF TIME

Month	1st	6th	11th	16th	21st	26th	31st
Jan.	S 3.5	S 5.8	S 8.0	S 9.8	S 11.4	S 12.7	S 13.6
Feb.	S 13.7	S 14.2	S 14.4	S 14.3	S 13.8	S 13.1	
Mar.	S 12.6	S 11.5	S 10.3	S 8.9	S 7.4	S 5.9	S 4.4
Apr.	S 4.1	S 2.6	S 1.2	F 0.1	F 1.2	F 2.2	
May	F 2.9	F 3.5	F 3.8	F 3.8	F 3.6	F 3.2	F 2.6
June	F 2.5	F 1.7	F 0.7	S 0.3	S 1.4	S 2.5	
July	S 3.5	S 4.4	S 5.2	S 5.8	S 6.2	S 6.3	S 6.2
Aug.	S 6.2	S 5.8	S 5.1	S 4.2	S 3.1	S 1.8	S 0.4
Sept.	F 0.1	F 1.5	F 3.2	F 5.0	F 6.8	F 8.5	
Oct.	F 10.2	F 11.7	F 13.1	F 14.3	F 15.2	F 15.9	F 16.4
Nov.	F 16.3	F 16.3	F 15.9	F 15.2	F 14.1	F 12.7	
Dec.	F 11.0	F 9.0	F 6.8	F 4.4	F 2.0	S 0.5	S 3.0

WHAT THE COLLEGE DESIRES OF THE HIGH SCHOOL IN THE TEACHING OF PHYSICAL GEOGRAPHY*

THE subject assigned me was what the college *requires* of the high school. In my opinion there is only one answer to this question, namely, *nothing*. The college does not and should not make any requirements of the high school. The college does require a certain amount of preliminary training of students desiring to take up and carry on the college studies. The prospective college student is expected to show that somewhere, in some way, he has had sufficient preparation to carry on the work given in the college courses. He may get this in the high school or he may get it somewhere else. Since but a small fraction of the high school students go to college the fitting of pupils for college should be a minor factor in the work of the high school.

* * * * Now as to physiography: let us see what the college expects or desires of the entering student and whether there is anything therein out of harmony with the high school ideals, should the student want to get this preliminary training in the high school. The college does not *require* any student to study physical geography in the high school or any other school in order to enter the college courses. (There may possibly be some exceptions to this but I do not know of any.) It asks the pupil to have had a certain number of hours or years of study along different lines of knowledge; one of these lines *may* be (not *must* be) physiography. If he chooses physiography as one of these lines of preparation then in New York State it expects him to have done a year's work of five periods a week in that subject and further that not less than one fifth of this work should be of a practical character, commonly designated laboratory work, part of which should be the study of physiographic features and agencies in field trips. No specific requirements are made in this line; both the quantity and kind of field work will depend on the location of the school, the size of the classes and particularly the training and energy of the teacher.

The laboratory indoors will likewise from necessity vary greatly in the kind of work done; the condition being that it be made as practical as possible and involve the study of *real things*. The dictation of notes by a teacher, the copying of a description of an experiment, or the copying of a diagram is not laboratory work. It means work actually done by the student involving observation of things, handling of instruments, study of rocks or minerals or maps or models, not someone else's description of them. This work should be done under the supervision of the teacher and the results recorded in a notebook. The value of the notebook is in the making of it.

*Abridged from an article by Prof. T. C. Hopkins of Syracuse University in *School Science and Mathematics*, October, 1911.

Is there anything in such a course inimical to any high school ideal? If so, is there not something wrong with the ideal?

The subject of physiography as now taught in the schools is a broad one and includes several somewhat diversified lines of study. It is not possible nor is it indeed desirable that all of these divisions should be treated exhaustively nor is it necessary that they should all be mentioned even. It is more important that one or more of the branches should be taken up with some degree of thoroughness in order that the student should get the spirit and something of the methods of scientific work.

The tendency in too many schools is to make the work too superficial and mechanical, with the idea of conning all the topics and memorizing enough to answer questions in a certain catechism. It may (or it may not) be necessary for the pupil to know something of the movements of the earth and the results produced; of the relation of the earth to the other heavenly bodies; something of the work of the atmosphere and the water on and under the earth; the land forms; the rocks and minerals composing the earth; the kinds of animals and plants and their distribution, but if in getting this varied knowledge he fails to realize that he is actually studying or can study the book of nature, that he actually sees the omnipotent forces and agencies at work and the effects produced by them in the making of the world in which he lives and forms a part: if he fails in this he fails in the most important part of the work, and he should omit some of the topics and spend more time in the contemplation of others.

From the standpoint of the college, or from any other rational standpoint, it were better for the pupils to have a good live knowledge of one or two of the topics than a superficial word knowledge of all of them. By good knowledge I mean that he gets into the heart of the subject and sees its relation to him and his daily life and a desire to further pursue the subject. It is only the superficial pupil that "knows it all." Many of the poorest students in the college classes in physiography are those who have made a high grade in the subject in high school. He has a superficial knowledge of the subject that causes him to hold his head so high that he cannot see the earth on which he walks. He gets a memory knowledge of the nomenclature with the idea that he has the subject-matter. He can give a definition of latitude and longitude but cannot tell the difference between them on the map. To him they are "imaginary lines" without use or significance. He can define a contour map but cannot use one. Spending too much time conning text-book definitions is one reason for such a condition and a probable remedy is more laboratory and field work. Another remedy is to have trained teachers; too frequently persons are required to teach physiography who know little or nothing about it and from necessity slavishly follow the text-book and miss the inspiration of the subject.